United States Patent [19]

Bennett

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[54] **TOE AND BALL LASTER AND THE LIKE**

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[73] Assignee: **International Shoe Machine Corporation,** Nashua, N.H.

[21] Appl. No.: **231,635**

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Related U.S. Application Data

[63] Continuation of Ser. No. 944,085, Dec. 22, 1986, abandoned.

[51] **Int. Cl.**[4] **B05C 3/20**
[52] **U.S. Cl.** **118/411;** 118/412
[58] **Field of Search** 118/411, 412, 315

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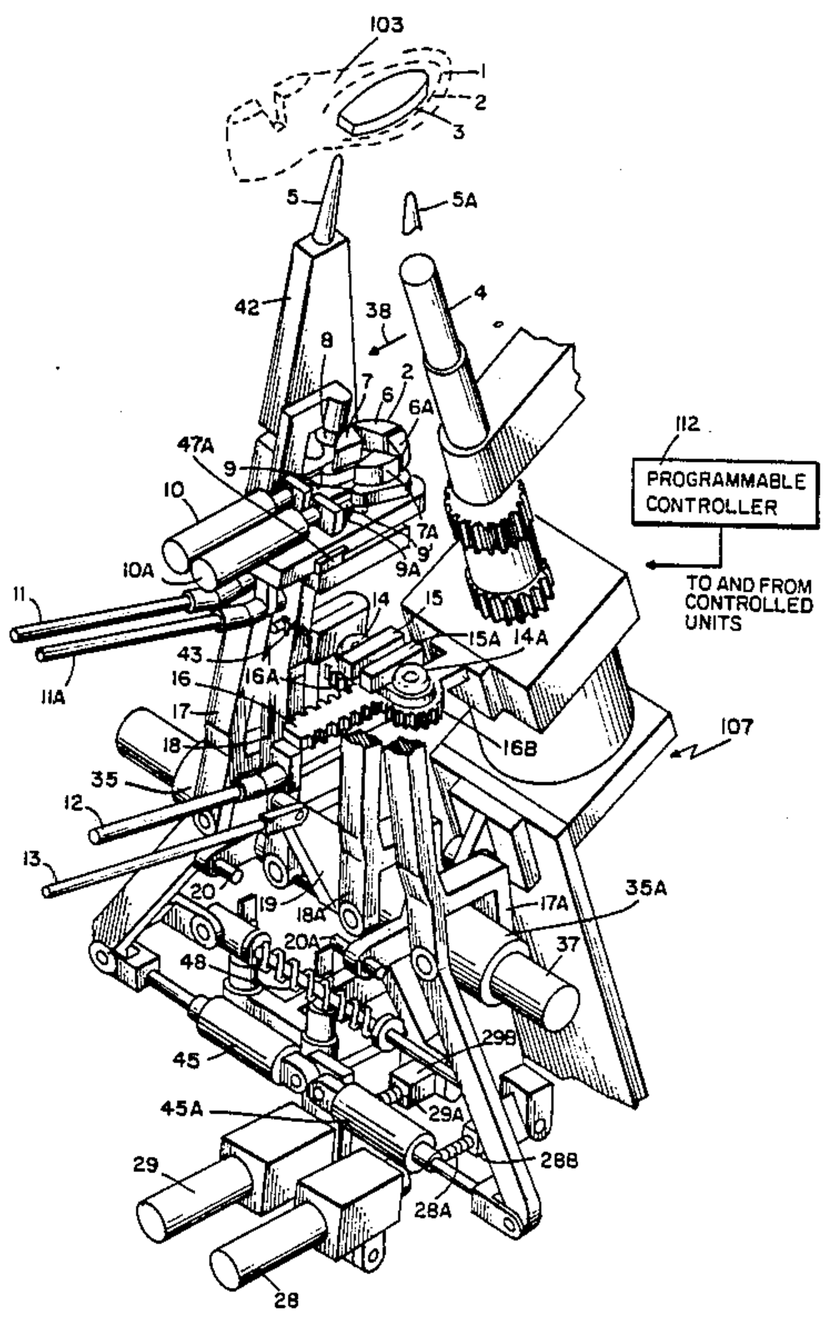
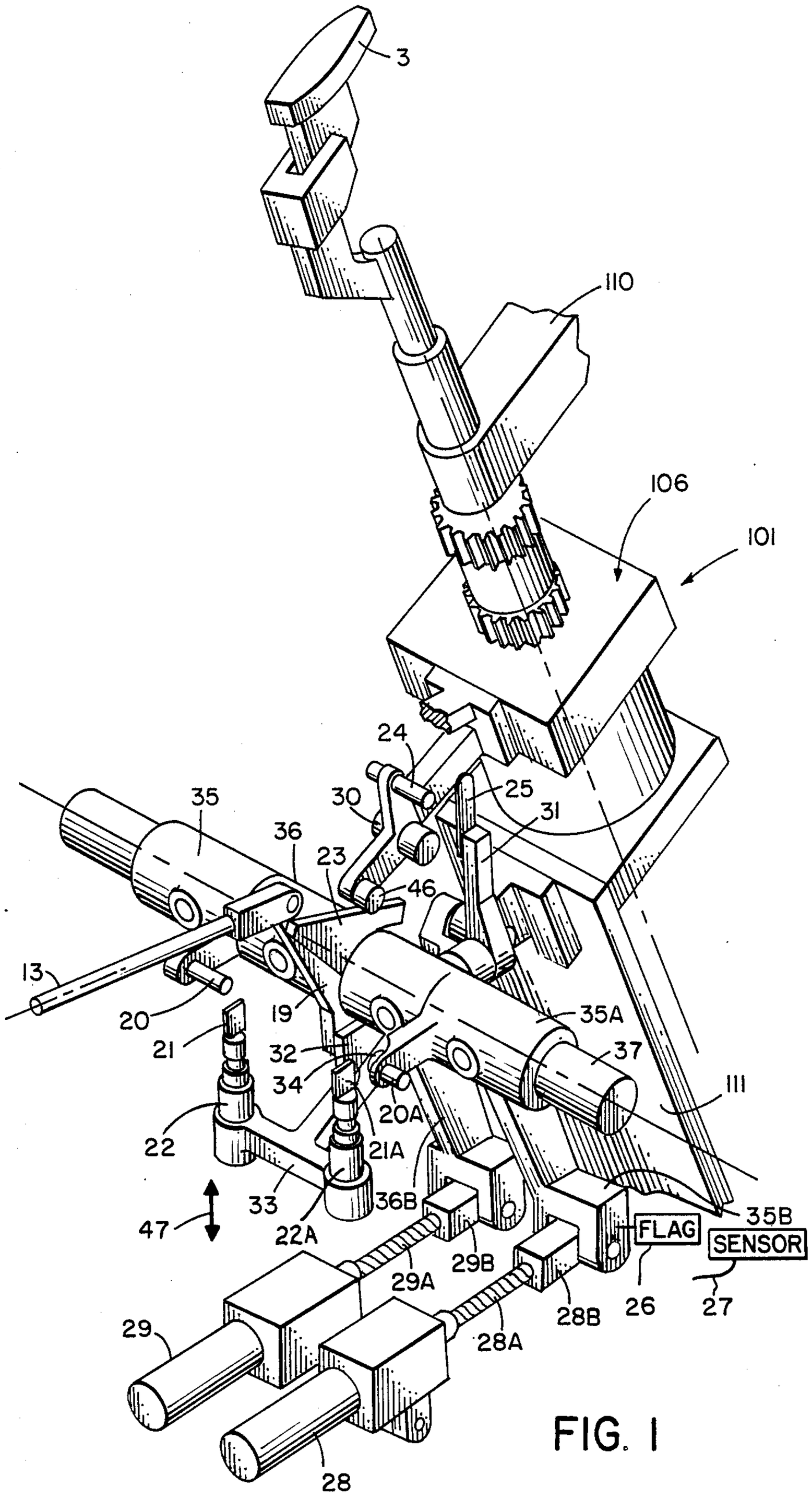
Assistant Examiner—Alain Bashore
Attorney, Agent, or Firm—Robert Shaw

[57] **ABSTRACT**

A machine to apply adhesive to the toe and ball region of a footwear upper assembly that includes a last, an upper draped about the last and an insole at the last bottom. The machine includes a pair of adhesive nozzles to apply the adhesive onto the footwear upper assembly near the edge of the insole, a pair of nozzle arms, one nozzle arm of the pair of nozzle arms being secured to each nozzle of the pair of adhesive nozzles and adapted to move the nozzle secured thereto; and a mechanical structure operable to guide the nozzles along respective paths adjacent each edge of the insole to deposit a ribbon of adhesive onto the upper assembly from the toe of the upper assembly to the ball region of the upper assembly. The mechanical structure includes a nozzle-guide template that is configured to an outline that, together with other mechanical structures, matches the outline of the insole between the toe and the ball region of the smallest upper assembly of the style to be lasted. The nozzle-guide template has a guide surface and is shiftable to accommodate, for example, right footwear upper assemblies and left footwear upper assemblies of the style to be lasted: The nozzle-guide template is composed of a plurality of segments at the toe region thereof to permit angular adjustment of one segment relative to the other to match the shape of the insole for footwear sizes larger than the smallest footwear upper assembly. A template follower is connected to each nozzle arm, one follower being positioned to ride along the guide surface of each nozzle-guide segment. A drive mechanism is provided to move the template follower from the toe region of its associated nozzle-guide template to the ball region thereof.

19 Claims, 4 Drawing Sheets

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110
106
101
24
25
31
30
35
36
23
46
13
20
19
21
32
34
35A
37
111
22
20A
21A
33
36B
47
22A
35B
FLAG
SENSOR
29A
29B
26
27
28B
28A
29
28

FIG. 1

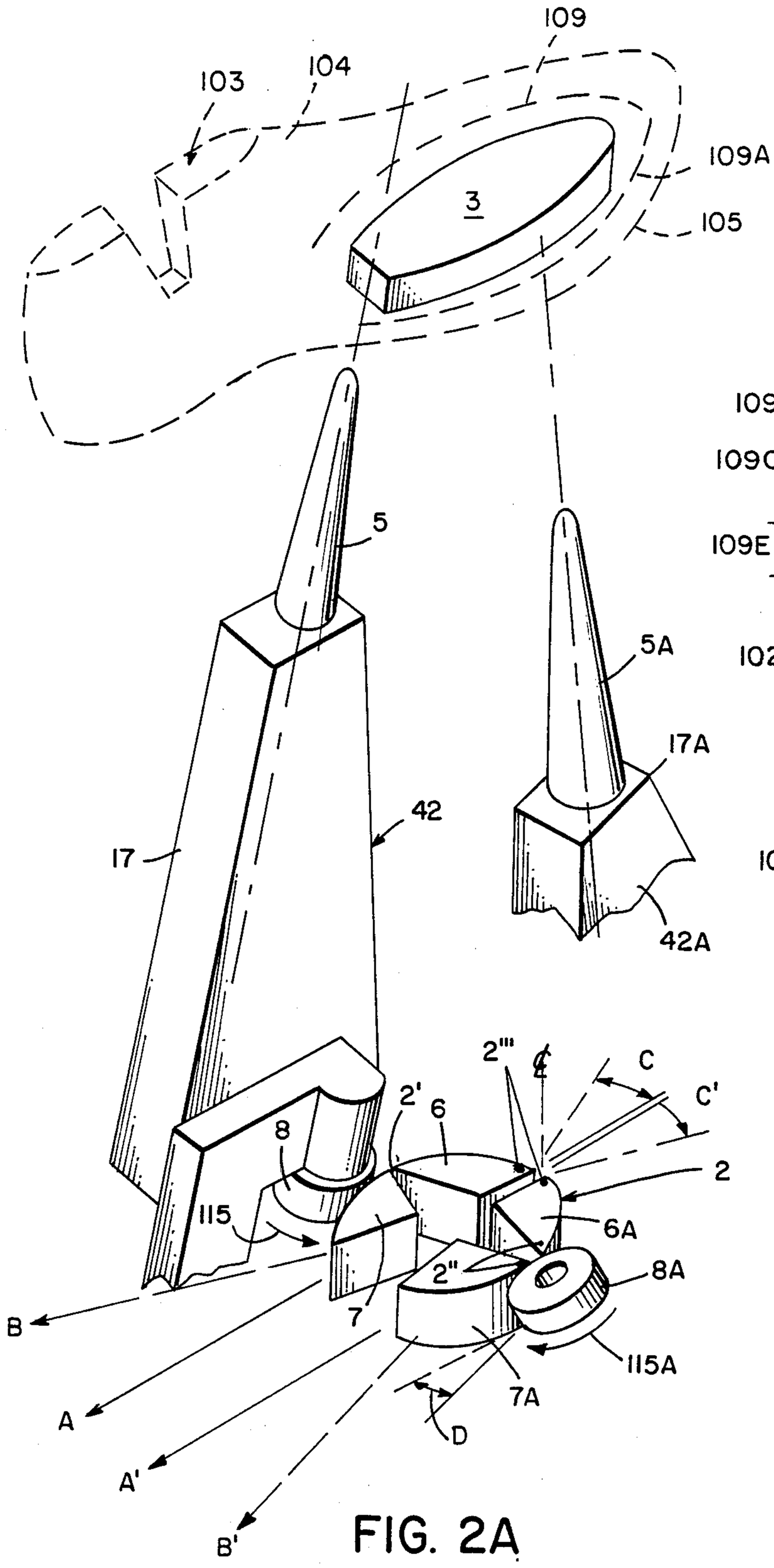

109
103
104
109A
3
105
5
42
17
5A
17A
42A
2'''
C
C'
2'
6
8
2
115
6A
2''
8A
7
115A
B
A
A'
B'
7A
D

FIG. 2A

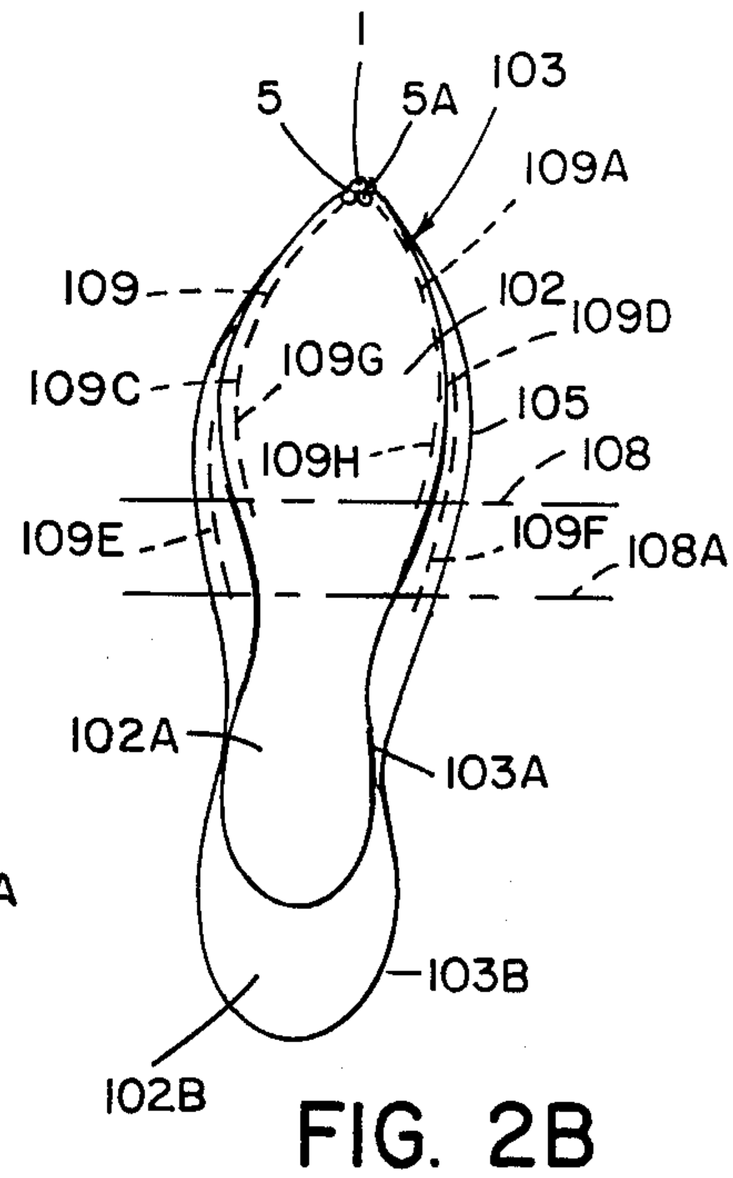
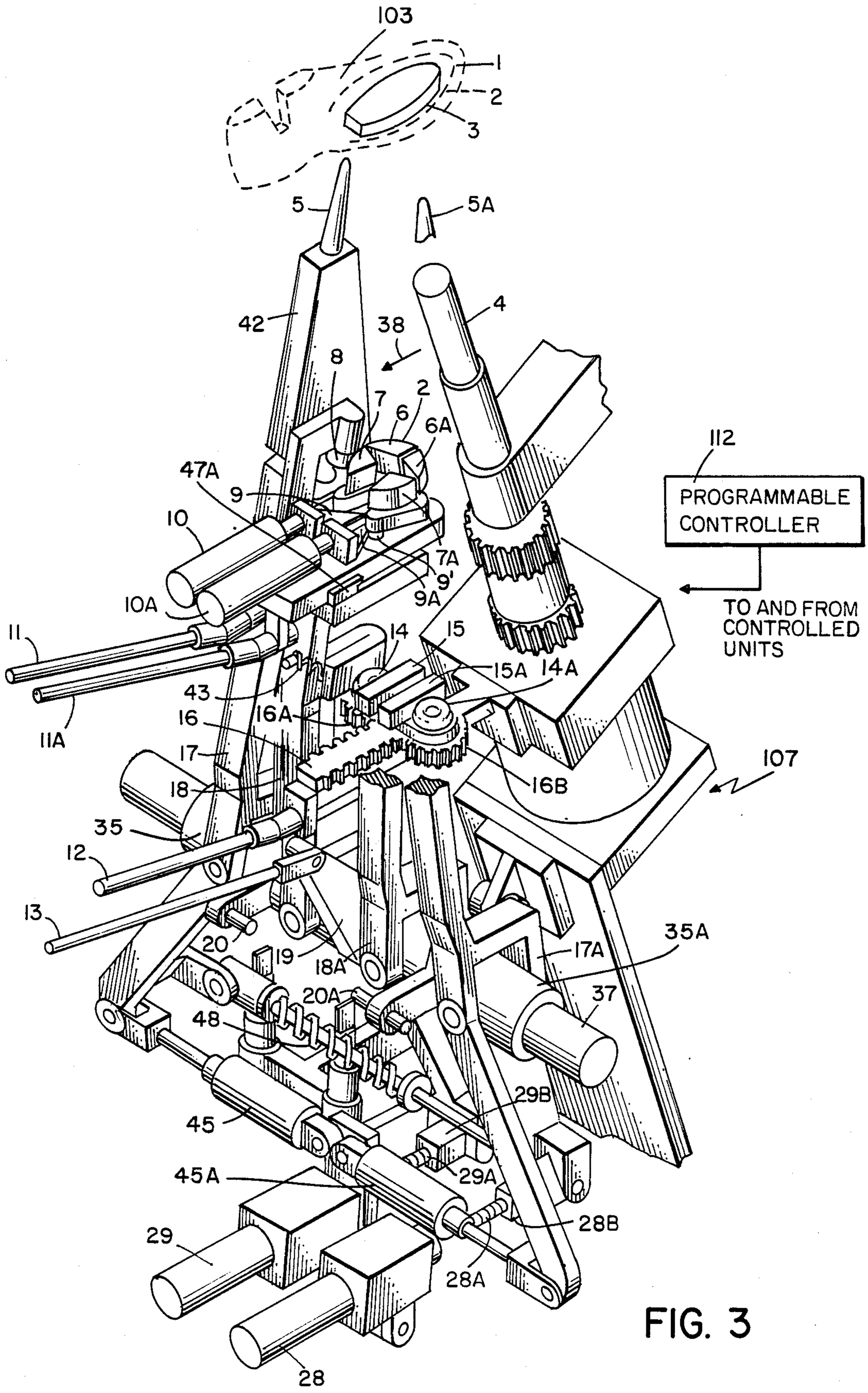

1
5
5A
103
109A
109
102
109D
109G
109C
105
109H
108
109E
109F
108A
102A
103A
103B
102B

FIG. 2B


103
1
2
3
5
5A
42
38
4
8
7
6
6A
2
112
47A
9
10
7A
9'
9A
PROGRAMMABLE CONTROLLER
TO AND FROM CONTROLLED UNITS
10A
11
14
15
15A
14A
43
16A
16
11A
17
16B
107
18
35
12
13
20
19
18A
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20A
37
48
29B
45
45A
29A
28B
29
28A
28

FIG. 3

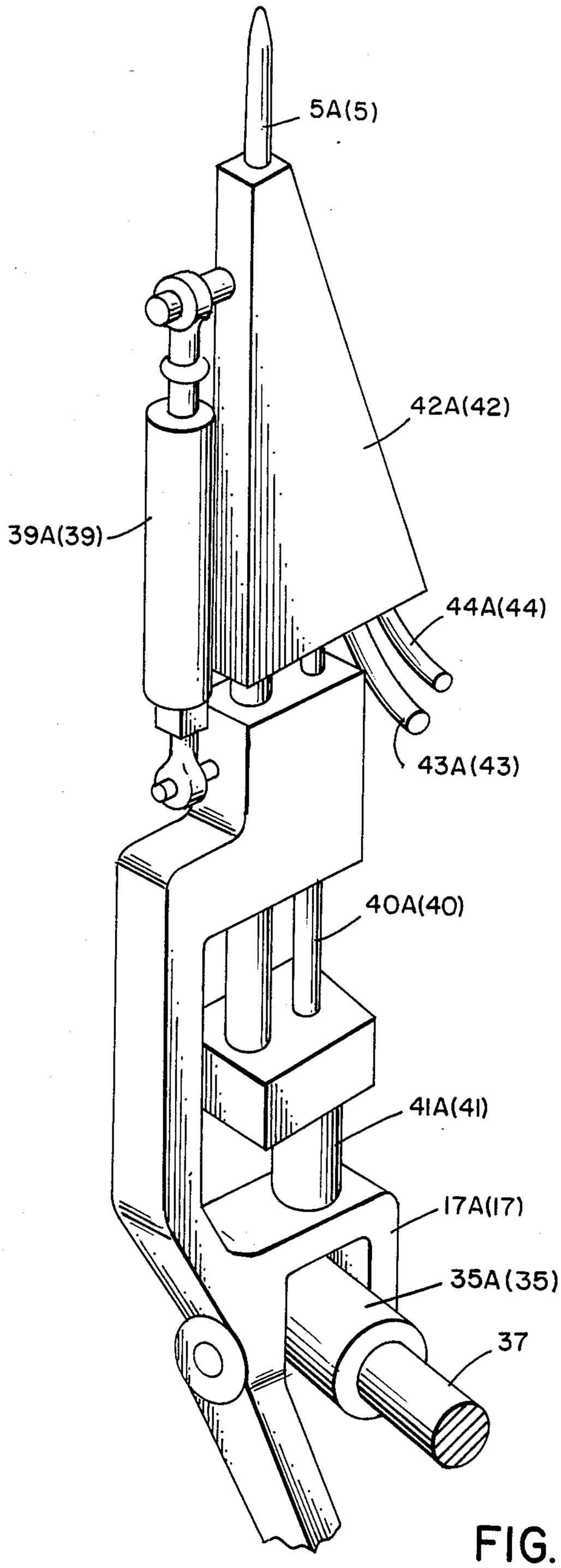

FIG. 4

TOE AND BALL LASTER AND THE LIKE

This application is a continuation of application Ser. No. 944,085, filed Dec. 22, 1986, now abandoned.

The present invention relates to machines particularly well adapted to last the toe and ball region of a footwear upper assembly.

While the present invention has applicability to footwear more generally, it is explained mostly in the context of shoe upper assemblies Furthermore, while the machine disclosed herein is discussed in greatest detail with respect to lasting of the toe and ball region of a footwear upper assembly, its use is broader in scope.

Presently used toe and ball lasters are disclosed in U.S. Pat. No. 4,517,697 (Vornberger). Other schemes have been presented for lasting the toe and ball region of a shoe upper assembly using microprocessor technology. The present invention, however, employs air cylinders, single-speed stepper electric motors and associated mechanical structures to guide adhesive extruding, single output nozzles while those nozzles move along and apply adhesive in and about the periphery of the insole of a shoe upper assembly. The upper assembly includes a last, an insole disposed at the last bottom and an upper draped about the last. Typically the last is disposed bottom down and the adhesive is distributed as two ribbons beginning at the toe of the shoe upper assembly and proceeding on the insole near its periphery, at each side thereof, to the ball region thereof. Conceptually the ribbon of adhesive could be placed onto the outwardly extending margin or at the confluence of the outwardly extending margin and the insole Irrespective of that issue, it is a principal object of the present invention to provide mostly a mechanically-based system—as distinguished from the essentially electrically-based and microprocessor-controlled systems now being proposed—to guide adhesive nozzles which deposit adhesive in the lasting of the toe and ball region of a shoe upper assembly.

Another object is to provide a system that uses cams and a guide template to direct the adhesive nozzles along acceptable paths between the toe and ball (or other) region of the shoe upper assembly at or near the periphery of the insole.

Still another object is to provide a machine that can be serviced in countries not technologically advanced, often using local facilities.

A still further object is to provide a machine that is significantly non- environmentally affected.

These and still further objects are addressed hereinafter.

The foregoing objects are attained, generally, in apparatus to apply adhesive to the toe and ball (or other) region of the insole of a footwear upper assembly that includes a last, an upper draped about the last and an insole at the last bottom, which apparatus includes a pair of adhesive nozzles to apply the adhesive onto the outer surface of the insole along a path near the edge at outside of the insole (or to another part of the upper assembly near the edge at outside of the insole); a pair of nozzle arms, each nozzle arm of the pair being connected to one of the pair of adhesive nozzles and adapted to move the associated nozzle secured thereto; a mechanical structure operable properly to guide the nozzles along respective paths adjacent the edge at each side of the insole to deposit a ribbon of adhesive onto the outer surface of the insole from the toe (or other) region of the upper assembly to the ball (or other) region of the upper assembly, the mechanical structure including four nozzle-guide segments that together and in combination are configured to form a nozzle-guide template having an outline that, together with other mechanical structures, matches the outline of the edge of the insole between the toe (or other region) and ball (or other) region of the smallest upper assembly of the style to be lasted, the nozzle-guide template having a guide surface and being shiftable to accommodate right footwear upper assemblies and left footwear upper assemblies of the style to be lasted, two of the nozzle-guide segments being pivotally connected to permit angular adjustment at the toe region thereof of one toe segment relative to the other to match the outline of the insole for footwear sizes larger than the smallest footwear upper assembly as well as for different insole shapes; a template follower connected to each nozzle arm, one template follower being positioned to ride along the guide surface at each side of the nozzle-guide template; and a drive mechanism operable to move the template follower from the toe (or other) region of the nozzle-guide template to the ball (or other) region thereof. The two segments at the toe region are pivotally connected to permit angular adjustment at the toe region and each is pivotally connected to one of the other segments at its ball end (or in such a way as) to provide a segmented template whose shape can be changed to accommodate various types of footwear.

The invention is hereinafter described with reference to the accompanying drawing in which:

FIG. **1** is an isometric view showing portions of a machine that includes apparatus to apply an adhesive (cement) to the toe and ball region of a shoe (or other footwear) upper assembly;

FIG. **2A** is an isometric view of a portion of the machine in FIG. **1** showing a mechanical system to guide adhesive-applying nozzles in the machine of FIG. **1**;

FIG. **2B** is a plan view bottom up of two shoe upper assemblies to show the outline of the shoe upper assemblies of differing shoe size;

FIG. **3** is an isometric view, like the view in FIG. **2A** and partly sectioned, but showing further related machine parts; and

FIG. **4** is an isometric view of the machine showing some parts not shown in other figures.

Turning now to FIG. **1**, there is shown at **101** portions of a machine to apply adhesive or cement to the toe and ball region of the insole labeled **102** in FIG. **2B** of a shoe (or other footwear) upper assembly **103** that includes a last **104** in FIG. **2A**, an upper **105** draped about the last and the insole **102** disposed at the bottom of the last **104**. (It will be appreciated on the basis of this disclosure that the present invention can be applied to depositing adhesives to other parts of the footwear upper assembly, but toe and ball lasting are discussed mostly herein) According to the present teaching, and it is a most important aspect of the present invention, a mechanical structure is provided to guide the nozzles labeled **5** and **5A** in FIG. **2B** between the toe region marked **11** (where the nozzles **5** and **5A** are positioned in FIG. **2B**) and the ball region of the upper assembly **103** to apply an adhesive as a ribbon—preferably onto the outer surface of the insole **102** near the periphery thereof on both sides of the insole—from the toe region of the shoe upper assembly **103** to and including the ball region thereof.

The actual apparatus that applies the ribbon of adhesive onto the insole **102** is generally shown at **107** in FIG. **3** which includes most of the interacting structures used to perform the various functions in accordance with the present teaching. The function of the apparatus **107** is to apply an adhesive ribbon **109** and an adhesive ribbon **109A** in FIG. **2B** from the nozzles **5** and **5A**, respectively, in FIG. **2A** onto the insole **102** of the upper assemblies **103A** and **103B** in FIG. **2B** In FIG. **2B** there are two upper assemblies **103**, **103A** and **103B**, the former representing the smallest assembly of one shoe type and the latter representing he largest of the same shoe the upper assembles **103A** and **103B** include insoles **102A** and **102B**, respectively. The nozzles **5** and **5A** are guided according to the present teaching by a mechanical guidance system that directs them along respective paths to apply the ribbon of adhesive at **109C** and **109D** (i.e., on the left side of the insole **102** and the right side of the insole **102**, respectively, in FIG. **2B**) at the toe region **1** of either assembly **103A** or **103B**; but toward the heel region the adhesive ribbon follows different paths (i.e., the paths labeled **109G** and **109H** for the smaller size upper assembly **103A** and the paths **109E** and **109F** for the larger size upper assembly **103B**) It is to provide a mostly mechanical guidance system for the nozzles **5** and **5A** to deposit the ribbons **109** and **109A** for the sizes **103A** and **103B**, and all sizes in between, that the present invention is directed. The end of the ribbon for the smallest size is approximately at **108** in FIG. **2B** and for the largest size is approximately at **108A**.

It will be appreciated that the mechanism **107** is part of a machine, for example, like that in the Vornberger patent, the adhesive extruding portions of the Vornberger patent being replaced by the nozzles **5** and **5A** herein and related apparatus. Thus the insole rest designated **3** in FIG. **2A** is similar to the insole rest shown in the Vornberger patent. The structure marked **106** in FIG. **1** is similar to or identical to structures in the Vornberger patent, and the structural members shown at **110** and **111** in FIG. **1** are attaching structures to a machine, for example, like that shown in the Vornberger patent. It is assumed that no further detailed explanation of the structure **106** is needed here. The remainder of this specification is directed mostly to the mechanism **107** which is a mostly mechanical structure whose function it is to direct the path of the adhesive nozzles **5** and **5A** at or near the edges of the insole **102** (that is, in the region of the edge at each side of the insole **102** between the toe part thereof and the ball part thereof), whereby ribbons of molten adhesive are applied onto the insole **102**, the margins of the upper **105** being thereafter wiped onto the insole in a known manner. (Conceptually, the adhesive can be applied onto the margin of the upper assembly, but preferably it is applied onto the outer surface of the insole **102**, near the edge or periphery of the insole.)

The apparatus **107** in FIG. **3** includes the pair of adhesive nozzles **5** and **5A** to apply adhesive onto the footwear upper assembly **103**—preferably onto the outer surface of the insole—near the edge (or periphery) of the insole **102** in FIG. **2B**. A pair of nozzle arms **17** and **17A** support and carry adhesive-extruding assemblies **42** and **42A**; one nozzle arm of the pair of nozzle arms **17** and **17A** is secured to each nozzle of the pair of nozzles **5** and **5A** and is adapted to move the nozzle secured thereto. The arm **17** is secured to and moves the nozzle **5** and the arm **17A** is secured to and moves the nozzle **5A**. The mechanical structure **107** is operable to properly guide the nozzles **5** and **5A** along the respective paths **109** and **109A** adjacent each edge of the insole **102** to deposit a ribbon of adhesive onto the upper assembly **103** from the toe of the upper assembly to the ball region of the upper assembly. A brief discussion of FIG. **4** is made at this juncture.

The structures shown in FIG. **4** are the right arm **17A** with the further parts of the assembly **42A** associated therewith. In FIG. **4** the corresponding parts associated with the arm **17** are shown in parentheses, e.g., the air cylinder **39**, the nozzles and so forth. In FIG. **4** the label **40A (40)** is for a shut-off needle valve; the label **43A (43)** is for a feed tube of adhesive; the label **44A (44)** is for an electrical conduit to a heater in the assembly **42A (42)**; the label **41A (41)** is for an air cylinder to activate the needle valve **40A (40)**; and the label **37** is for a pivot shaft, later discussed. The needle valve **40A (40)** is moved up and down in FIG. **4** respectively to stop adhesive flow from the nozzle **5A (5)** and to start flow therefrom.

In the shoemaking process, one approach is that of lasting the toe region of the shoe upper assembly first; then the ball and heel region are lasted. Typically the adhesive is applied onto the insole, which is disposed bottom down in a machine like that shown in the Vornberger patent, and the margin of the upper assembly is then wiped onto the insole. That is done according to the present teaching except that both the toe region and the ball region of the insole have adhesive applied thereto by two single-output nozzles and are wiped. The point made here is that, conceptually, the adhesive could be applied to the margin of the upper assembly, rather than the insole, and the wiping could be effected, but application of adhesive as a ribbon on the insole is preferred, and either location comes within the characterization that adhesive is applied in the region of the periphery of the insole.

The single-output nozzles **5** and **5A** begin the adhesive applying cycle at **1** in FIG. **3**, which is the position of the nozzles **5** and **5A** shown in FIG. **2B**, the nozzles **5** and **5A** first having been raised vertically by the cylinders **39** and **39A**, respectively, in FIG. **4**. A stepper motor **28** in FIG. **1** positions the nozzles **5** and **5A** to track along the cement paths **109** and **109A** in FIGS. **2A** and **2B** to deposit the adhesive as a continuous ribbon at **109** and **109A**. The arms **1** and **17A**, and hence the nozzles **5** and **5A**, are allowed to move in a universal manner by pivoting on parts **35** and **35A**, respectively, in FIG. **1**, that also pivot on a shaft **37**. The arms **17** and **17A** are respectively attached to cam rolls (or rollers) **8** and **8A** in FIG. **2H** which are held against a contour template **2**, formed of four segments **6**, **7** and **6A**, **7A**, by a spring **48** in FIG. **3**. It will be noted that the segments **6**, **7**, **6A** and **7A** each represents essentially one ninety degree quadrant of the template **2** which, when the segments are together, is, or can be, almost circular in plan view. However, the toe-end segments **6** and **6A** are individually pivotal at **2'''**at the toe region thereof; the segments **6** and **7** are pivotal at **2'**; and the segments **6A** and **7A** are pivotal at **2''**. To summarize, for any shoe style, two sets of template segments **6-7** and **6A-7A** (four segments, two segment units or sets) is established. For any shoe size or a style, each segment set **6-7** and **6A-7A** pivots at the region **2'''** to some angle determined by the shoe size of the particular style. Further, as is noted below, the segments **6** and **7**, as a unit, and the segments **6A** and **7A**, as a unit, can move in the

direction of the arrows A and B and A′ and B′, respectively, to accommodate various shoe sizes and shapes. A signal from the programmable controller **112**, in FIG. **3** causes the motor **29** to start motion of the segments **6** and **7** in the directions of the arrows A to B in FIG. **2A** and the segments **6A** and **7A** in the directions of the arrows A′ to B′.

With reference now to FIGS. **2A** and **2B**, the function of the contoured template or nozzle-guide assembly **2** is to guide the followers **8** and **8A** along appropriate paths so that the nozzles **5** and **5A** will apply appropriate ribbons of adhesive **109** and **109A**, as now explained. The template segments **6**, **7**, **6A** and **7A** are replaceable to accommodate various shoe styles. The shape of any particular template **2**, and hence the segments **6**, **7**, **6A** and **7A**, is determined by the smallest size of the shoe style For that smallest size, the template segments **6**, **7**, **6A** and **7A** may all be touching one another, that is, closed together in FIG. **2A**; but typically they will be pivotally separated from one another, as shown in FIG. **2A**, to accommodate for left or right shoes and exact sizes Thus, the template segments introduce flexibility.

In operation the follower **8** in FIG. **2A** initially moves or rolls counterclockwise (see arrow **115**) along the outer surface of the template segment **6** and the follower **8A** moves or rolls clockwise (see arrow **115A**) along the outer surface of the template segment **6A**; at an intermediate point the follower **8** rolls onto and along the outer surface of the template segment **7** and the follower **8A** rolls onto and along the outer surface of the template segment **7A**. At that juncture, typically, the followers will have completed the necessary travel on the smallest shoe size and to have applied adhesive ribbons **109** and **109A** to the line **108** in FIG. **2B**, that is, from the toe region to the ball region of the smallest shoe size of a given type. When apply adhesive ribbons onto the insole **102** of shoe sizes larger than the smallest shoe size of a type, the template segments **6-7** and **6A-7A** are caused to move in the direction of the arrows A or B or A′ or B′, respectively, or any direction in between, as noted elsewhere herein. The template segments **6** and **7** move as a unit in the direction of the arrows A or B or any direction in between; the template segments **6A** and **7A** simultaneously move as a unit in the direction of the arrows A′ or B′ or any direction in between. Simultaneously, the followers **8** and **8A**, in FIG. **2A**, are being moved along the outer perimeter surface of the corresponding segments or segment units **6-7** and **6A-7A** to move the nozzles **5** and **5A**, respectively, along the correct paths for adhesive deposit which ends at the appropriate line **108** or **108A** or any line in between. The labels **2′** and **2″**, as above indicated, represent pivots (or regions of pivot) between template segments **6** and **7** and **6A** and **7A** about which the associated template segments pivot to accommodate right shoe assemblies and left shoe assemblies; the degree of pivot may also be related to shoe sizes or types. There is also the pivot region at **2‴**, as above noted, to an angle C for the segments A and **7A** and C′ for the segments **6** and **7** to provide an adjustment because of size. It will be appreciated in this explanation that it is the size or style of the insole being processed or lasted that determines all movement of the nozzles **5** and **5A** and hence the nozzle-guide assembly **2**.

The mechanisms to move the segments **6**, **6A**, **7** and **7A** and the followers **8** and **8A** are now discussed, mostly with reference to FIGS. **1** and **3**, beginning with the followers. The followers **8** and **8A** are attached to the arms **17** and **17A**, respectively, which are driven by the stepper motor **28** which is turned on and off by the programmable controller **112** which also controls the start of the adhesive extrusion and start of nozzle travel and control from beginning to end When the motor **28** is energized, it rotates the ballscrew marked **28A** and hence moves a ball nut **28B** to right and left in FIG. **1**; it pivots an arm **35B** counterclockwise about a shaft **37** to which are keyed sleeves **35** and **35A**. The cement arms **17** and **17A** are pinned to the sleeves **35** and **35A** and hence pivot together with the sleeves; the pinning also permits the arms **17** and **17A** to pivot about an axis orthogonal to the axis of the shaft **37** by forces originating with the followers **8** and **8A** as the followers move along the template. The adhesive extrusion is stopped by signals from sensors **20** and **20A** in combination with flags **21** and **21A**; the same signals also start the nozzles **5** and **5A** down. It will be understood that the connecting structure for the arms **17** and **17A** is a universal joint about which the arms pivot in a motion whose configuration is determined by the template **2**.

Movement of the template segments **6-7** and **6A-7A** along the directions A . . . is similar to that discussed above with respect to the followers **8** and **8A** in that stepper motor **29** rotates a ball screw **29A** and hence moves a ball nut **29B** to the right and left in FIG. **1**, pivoting an arm **36B**, again about the shaft **37** through a sleeve **36** to which are attached arms **18** and **18A** in FIG. **3**. The arms **18** and **18A** are also universally attached to pivot about the shaft **37**. The segments are attached to the arms **18** and **18A** and it is the arms **18** and **18A** that provide movement along the directions A or B or A′ or B′, the exact direction of movement being determined in a manner now explained.

A follower **14** in FIG. **3** is attached to the arm **18** and a like follower **14A** is attached to the arm **18A**. The follower **14** follows along a guide bar **15** while, simultaneously, the follows **14A** follows along a guide bar **15A**. The guide bars **15** and **15A** are adjustable either parallel to one another to provide motion A-A′ or at an angle to one other to provide motion B-B′ (or any angle therebetween). A rack **16** and pinions **16A** and **16B** ,effect angular adjustment of the guide bars **15** and **15A**, adjustment being through a rotary adjustment shaft **12**.

Air cylinders **10** and **10A** shift segments **7** and **7A** about **2′** and **2″**, respectively, to accommodate left shoes or right shoes, as above note, by movement of guide elements **9** and **9A** under the action of the air cylinders causing movement of elements **9′** (only one shown) connected respectively to segments **7** and **7A** as in FIG. **3**. Rotation of rods **11** and **11A** effect pivoting at **2‴** to the angles C-C′ in FIG. **2A**. A spring **43** causes the cam rolls **14** and **14A** to remain in contact with the guide bars **15** and **15A** A spring **48** causes arms **17** and **17A** and, hence, cam rolls **8** and **8A** to keep in contact with the segments **6**, **6A**, **7** and **7A**. For square toe applications cylinders **45** and **45A** provide transverse forces on the followers **8** and **8A** to cause the followers to move along the template.

Pivoting at **2‴** is effected by two circular guide plates, e.g., a guide plate **47A** which pivots the segments **6A** and **7A** as a unit **6A-7A** at **2‴** counterclockwise and clockwise in FIG. **3**. A like plate pivots the segments **6** and **7** as a unit **6-7** at **2‴** clockwise and counterclockwise. It will be appreciated that **2‴** is a region of pivot—not a pivot point. The segmented units **6-7** and **6A-7A** are not connected to one another at the pivot region **2‴** and can move away from one another during

the linear or translational movement mentioned elsewehere herein.

It has been found for present purposes and on the basis of the teachings herein that a segmented template **2** for any shoe style can be formed by a combination of graphical and triangulation methods known in the mechanical arts. Briefly, the rotational axes of the rollers **8** and **8A** are located in the machine with respect to the adhesive paths **109** and **109A** and relative positions between these machine parts and locations determine the external contour of the segmented template **2** and hence the path of travel of the rollers **8** and **8A** along the external contour of the template **2**. Variations in the paths **109** and **109A** of the adhesive ribbon can be accommodated by positional changes of the segments **6**, **6A**, **7** and **7A** of the template **2** about the pivots **2'**, **2''**and **2'''**, plus changes in the angles A to B and A' to B' and changes in segment size.

Turning now to FIG. **1**, a rod **13** connects to a heel-lock assembly (not shown) whereby the shoe size is established. If the rod **13** is all the way to the right in FIG. **1**, a small shoe is indicated. The rod **13** is attached to a sensor-cam mounting plate **19** that is journalled to the shaft **37**; the plate **19** supports sensor cams **23** and **32** on which ride a roller **46** and a roller **34**, respectively. A sensor **24** pivots about a shaft **30** under control of the roller **46** to establish the stop point for the motion of the templates along the paths whose directions are A or B or A' or B' or any angle therebetween; start of that motion is determined by a sensor **27** in FIG. **1** in cooperation with a sensor flag **26** which moves left and right with rotation of the rod **28A** to which it is attached. The sensor **24** similarly cooperates with a flag **25** which is attached to the arm **31** which is attached to the sleeve **36** which, as above-noted, is moved by the motor **29**.

The motor **28** at all times gives maximum travel to the arms **17** and **17A**; that is, for the largest shoe size, but the air cylinder **39** or **39A** in FIG. **4** pulls the associated nozzle downward and away from the inner sole at the appropriate stop point **108** or **108A** (or any point in between) and simultaneously moves the needle **40A** (**40**) upward to terminate adhesive flow from the nozzle **5A** (**5**). The signal for such purpose comes from the sensors **20** and **20A** in cooperation with flags **21** and **21A** which are positioned by the sensor cam **32**. A cam roll **34** is attached to an arm **33** which holds the flags **21** and **21A** which are shiftable up or down (see arrow **47**) by air cylinders **22** and **22A** to provide proper shut-off and pull-down at a left or right ball break, much the same as the segments were shifted for right and left shoes. This is needed because the length of adhesive **109** differs from the length of adhesive **109A**; hence adhesive termination and pull-down differs from one side to the other. While, as noted above, emphasis in this specification is on application of adhesive at each side of a footwear upper assembly between the toe region and ball region thereof, it will be seen on the basis of the foregoing teachings that the adhesive can be applied to other parts of the footwear upper assembly.

Modifications of the invention herein disclosed will occur to persons skilled in the art and all such modifications are deemed to be within the scope of the invention as defined by the appended claims.

What is claimed is:

1. Apparatus to apply adhesive to the toe and ball region of a footwear upper assembly that includes a last, an upper draped about the last and an insole at the last bottom, which apparatus comprises:

a pair of adhesive nozzles to apply the adhesive onto the footwear upper assembly near the edge of the insole;

a pair of nozzle arms, one nozzle arm of the pair of nozzle arms being secured to each nozzle of the pair of adhesive nozzles and adapted to move the nozzle secured thereto;

a mechanical structure operable to guide the nozzles along respective paths adjacent each edge of the insole to deposit a ribbon of adhesive onto the upper assembly from the toe of the upper assembly to the ball region of the upper assembly, said mechanical structure comprising a nozzle-guide template that is configured to an outline that, together with other mechanical structures, matches the outline of the insole between the toe and the ball region of the smallest upper assembly of the style to be lasted, the nozzle-guide template having a guide surface and being shiftable to accommodate right footwear upper assemblies and left footwear upper assemblies of the style to be lasted, said nozzle-guide template comprising a pair of nozzle-guide segments individually pivotally connected at the toe region thereof to permit angular adjustment of one segment of the pair of segment relative to the other to match the shape of the insole for footwear sizes larger than the smallest footwear upper assembly;

a template follower connected to each nozzle arm, one follower being positioned to ride along the guide surface of each nozzle-guide template; and

drive means operable to move the template follower from the toe region of its associated nozzle-guide template to the ball region thereof.

2. A lasting machine according to claim **1** in which each of the pair of nozzle-guide segments is adapted to move along a path having a longitudinal component, said lasting machine having a template drive mechanism connected to move the segments along said path.

3. A lasting machine according to claim **2** in which the template drive mechanism is operable to move the segments along a path having said longitudinal component, but having as well, a transverse component whereby the templates pivot about the toe region of the pair of nozzle-guide templates to provide said transverse component.

4. A lasting machine according to claim **3** in which the template drive mechanism includes a template arm connected to each segment of the pair of nozzle-guide segments, a template follower connected to each template arm and an angularly adjustable arm and a guide bar associated with each template follower such that the associated template follower moves along and is guided by the guide bar associated therewith.

5. A lasting machine according to claim **1** in which the adhesive nozzles apply the adhesive ribbon at each side of the insole onto the outer surface of the insole near the edge thereof.

6. A lasting machine according to claim **1** in which said template follower is spring loaded to maintain rolling contact with the template but in which air cylinders are provided to provide transverse forces on each follower to counteract spring pressures for square-toe footwear upper assemblies.

7. Apparatus to apply adhesive to a footwear upper assembly that includes a last, an upper draped about the last and an insole at the last bottom, which apparatus comprises:

adhesive nozzle means to apply the adhesive onto the footwear upper assembly near the edge of the insole;

nozzle arms means secured to the adhesive nozzle means and adapted to move the adhesive nozzle means secured thereto;

a structure operable to guide the nozzles along respective paths adjacent each edge of the insole to deposit a ribbon of adhesive onto the upper assembly, said structure comprising a nozzle-guide template that is configured to an outline that, together with other mechanical structures, matches the outline of the insole of the portion to be lasted of the smallest upper assembly of the style to be lasted, the nozzle-guide template having a guide surface and being shiftable to accommodate different shaped upper, assemblies, said nozzle-guide template comprising segments individually pivotally connected at the toe region thereof to permit angular adjustment of each segment relative to the other to match the shape of the insole for footwear sizes larger than the smallest footwear upper assembly;

a template follower connected to each nozzle arm, one follower being positioned to ride along the guide surface of each nozzle-guide segment; and

drive means operable to move the template follower along said guide surface.

8. A lasting machine to apply adhesive to a footwear upper assembly that includes a last, an upper draped about the last and an insole at the last bottom, which machine comprises:

adhesive nozzle means comprising two nozzles to apply the adhesive onto the footwear upper assembly near the edge of the insole;

nozzle arm means secured to the adhesive nozzle means and adapted to move the adhesive nozzle means secured thereto, the nozzle arm means including two nozzle arms, one nozzle arm connected to each of the two nozzles;

a guide structure mechanically connected to the nozzle arm means, which is operable to guide the nozzle arm means and, hence, the two nozzles along paths adjacent the edge of the insole to deposit a ribbon of adhesive onto the upper assembly, said guide structure comprising a nozzle-guide template that is configured to an outline that, together with other mechanical structures that interact therewith, matches the outline of a portion of the insole to be lasted, the nozzle-guide template having a guide surface and being shiftable to accommodate different shaped upper assemblies, said nozzle-guide template comprising a pair of nozzle-guide segments having a toe region and being pivotally connected at the toe region thereof to permit angular adjustment of each segment relative to the other to match, in conjunction with the other mechanical structures that interact therewith, the shape of the insole of the footwear upper assembly;

a pair of template followers associated with the nozzle arm means, one template follower being connected to each nozzle arm, one template follower being positioned to ride along the guide surface of each nozzle-guide segment; and

drive means operable to move the template followers along said guide surface.

9. A lasting machine according to claim **8** in which each of the pair of nozzle-guide segments is adapted to move along a path having a longitudinal component, said lasting machine having a template drive mechanism connected to move the segments along said path.

10. A lasting machine according to claim **9** in which the template drive mechanism is operable to move the segments along a path having said longitudinal component, but having a transverse component as well.

11. A lasting machine according to claim **10** in which the template drive mechanism includes a template arm connected to each segment of the pair of nozzle-guide segments, a template arm follower connected to each template arm, and an angularly adjustable arm and a guide bar associated with each template follower arm such that the associated template follower moves along and is guided by the guide bar associated therewith.

12. A lasting machine according to claim **8** in which the adhesive nozzles apply the adhesive ribbon at each side of the insole onto the outer surface of the insole near the edge thereof.

13. A lasting machine according to claim **8** in which the guide structure comprises two segment pairs, each pair acting as a unit, each segment of a unit being pivotal with respect to the other segment of the unit, each said unit being adapted to move along a path having a longitudinal component and a transverse component, said lasting machine having a template drive mechanism connected to drive each unit along its respective path.

14. For use in a system that includes adhesive nozzle means to apply an adhesive onto a footwear upper assembly near the edge of the insole thereof, said footwear upper assembly including a last, an upper draped about the last and said insole at the last bottom,

a structure operable to guide the nozzle means along a path adjacent each edge of the insole to deposit an adhesive onto the upper assembly, said structure comprising a nozzle-guide template having a guide surface that is configured to an outline that, together with other mechanical structures that interact therewith, matches the outline of the insole of the portion to be lasted of the upper assembly of the style to be lasted, the nozzle-guide template being shiftable to accommodate at least one of different shaped and sized upper assemblies, said nozzle-guide template comprising segments having a toe region and being individually pivotally connected at the toe region thereof to permit angular adjustment of each segment relative to the other to match at least one of each shape and size of the insole of the footwear upper assembly;

a template follower connected to ride along the guide surface of each nozzle-guide segment and adapted to guide the nozzle means; and

drive means operable to move the template follower along said guide surface.

15. In the system of claim **14**, apparatus in which each of the segments is adapted to move along a path having a longitudinal component and a transverse component and which includes a template drive mechanism connected to move each segment along its respective path, said adhesive being applied from the toe region of the footwear upper assembly to and including the ball region thereof.

16. In the system of claim **14**, apparatus wherein said template comprises four segments which are connected to act as two-segment pairs, a first-segment pair and a second-segment pair, wherein each segment pair is adapted to move along a distinct path and which includes a template drive mechanism connected to move each said segment pair along its respective path while

the template follower associated with each segment pair is moved along the guide surface of its associated segment pair.

17. A lasting machine according to claim **16** in which each pair of nozzle-guide segments is adapted to move along a path having a longitudinal component, said lasting machine having a template drive mechanism connected to move each said segment pair along its respective path.

18. A lasting machine according to claim **17** in which the template drive mechanism is operable to move each segment-pair along a path having said longitudinal component, but having as well, a transverse component, wherein each segment pair is pivotal at about the toe region thereof to provide said transverse component.

19. A lasting machine according to claim **18** in which the template drive mechanism includes a template arm connected to each segment pair of nozzle-guide segments, a template follower connected to each template arm and an angularly adjustable arm and a guide bar associated with each template follower such that the associated template follower moves along and is guided by the guide bar associated therewith.

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